DOCUMENT RESUME

ED 104 747 SO 008 212

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TITLE National Income Elasticities of Educational and Non-Educational Government Expenditures Among Selected Nations.
PUB DATE 75
NOTE 20p.; Paper presented at the Annual Meeting of the American Educational Research Association (Washington, D. C. March 30-April 3, 1975)

EDRS PRICE MF-$0.76 HC-$1.58 PLUS POSTAGE
DESCRIPTORS Developed Nations; Developing Nations; *Economic Development; *Educational Economics; Educational Research; *Financial Policy; *Fiscal Capacity; International Education; *Productivity; Resource Allocations

ABSTRACT

The main purposes of this study are to investigate through national income elasticities the amounts of governmental expenditure in 30 countries on total governmental service and on selected services of education, defense, health, and social welfare over the period from 1950 to 1967. Analysis of data available from various statistical sources, such as the United Nations Statistical Yearbook, is accomplished with a regression formula to compute national income elasticity values and with the Pearson produce-moment correlation coefficient to examine the relationship between national income and government expenditures. Results of the study show that coefficients of national income elasticity for education are higher than other categories of governmental expenditures, indicating a favorable recognition of education; higher income countries tend to allocate more for education than low income ones, implying the need for international aid to those countries as a means for closing the gap between high and low incomes; and low income countries have a greater income elasticity for education, indicating that they attach greater importance to education than high income countries where a greater capacity for spending exists. (Author/JH)

ED104747

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NATIONAL INCOME ELASTICITIES OF EDUCATIONAL AND NON-EDUCATIONAL GOVERNMENT EXPENDITURES AMONG SELECTED NATIONS

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Paper prepared for presentation
at the 1975 Annual Meeting of the
American Educational Research Association
Washington, D. C.
March 30-April 3, 1975

SP008212

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INTRODUCTION

Economists, from the time of Adam Smith, have provided sufficient evidence, both in theory and through research, that education can make a large contribution to the growth of the economy of a nation (41). They have regarded the growth and diffusion of invention and innovation, which belong to the domain of education, as significant factors in facilitating a nation's economic growth.

Besides Adam Smith, notable classical economists such as Marshall (30), Mill (30) and Ricardo (30) and, more recently, Schultz (32,33,34, 35), Denison (9, 10), Clark (6, 7), Becker (1, 2), Miller (26, 27, 28), Benson (3), and Groves (16) have emphasized the importance of education in the growth of national economy.

McLure (25, p. 7) presents this notion of the education-productivity relationship in a summarized synthesis:

> Expenditures for education are related to the rate of economic growth. Exact measurement on the returns for investment in education are not available, but there is increasing evidence that increased investment in education is producing a growth in the economy which more than compensates for the additional resources allocated to education. In other words, the expenditures for education now appear to be accelerating the rate of economic growth...

If it is true that education contributes significantly to the economic growth of a nation, a foremost question is how expenditures for the educational function of each nation's government have been regarded over the years in relation to changes in national income by various countries. Furthermore, how do educational expenditures actually compare with expenditures on other governmental functions, such as defense, health, and other social services? In other words, has the rate of increase in governmental funding for education been faster or slower than the rate of increase in national income? Has the rate of expenditures for education been faster or slower than rates of increase of other categories of governmental spending?

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Purpose of the Study

The main purpose of this study was to investigate responsiveness as measured in terms of national income elasticities of 1) total governmental services and 2) selected services of education, defense, health and social welfare over the years among various countries. Analysis is focused on education in relation to other governmental sectors.

This study also attempted to measure: 1) the relationships between governmental expenditures and the national income of each country; 2) the variance among selected national income elasticities in relation to the level of national income over a period of years; 3) the yearly relationship between the rate of increase in public expenditures for education and the rate of national economic growth of all countries included in this study; and 4) the variation of governmental financial effort devoted to education in relation to the national income level.

METHODS, PROCEDURES, AND SOURCES

The methods of analysis, procedures of data treatment, and sources of data for the investigation of this study are described in this section. The important part of this study is designed to provide comparative data on responsiveness of educational and selected non-educational government expenditures in relation to change in Gross National Product of each country for the eighteen-year period from 1950 to 1967. The sample includes thirty countries selected primarily on the basis of data availability.

National income elasticity values of selected variables are divided according to the level of national income: high and low income groups, so that each mean elasticity value can be compared with the other income level class. The method of classifying income groups into the high and the low is based on the level of per capita Gross National Product (expressed in United States' dollars) in 1967.

Among the thirty countries, fifteen countries at the top, ranked in terms of Gross National Product values of 1967, are classified as the high income countries and those from sixteenth through the thirtieth are grouped as the low income countries.

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These two classes are not made on the basis of actual purchasing power of per capita GNP throughout the eighteen-year period but based on the rankings, only expressed in United States' dollars at current market prices of 1967. The dollar values here are obtained from the computation that national currency values are divided by each nation's currency exchange rates into United States' dollars.

Included in the high income country group are: Australia, Canada, Denmark, France, Federal Republic of Germany, Ireland, Italy, Japan, Netherlands, New Zealand, Norway, Sweden, Switzerland, United Kingdom, and United States. The low income country group is comprised of Argentina, Ceylon, Chile, The Republic of China, Colombia, Costa Rica, Honduras, India, The Republic of Korea, Mexico, Portugal, South Africa, Thailand, Turkey, and Venezuela. Each group is composed of fifteen countries respectively. In addition, the mean elasticity value of one variable, for instance, is again compared with elasticity values of other variables of the same and different income classes. Analyses of the results derived from this design are directed to the following two questions:

1. How have governmental expenditures for educational and selected non-educational functions--total government, defense, public health, and social welfare*--among various countries responded over the period from 1950 to 1967 in relation to changes in their national income?
2. Are these different levels of responsiveness in expenditures on governmental functions over this period of years related to the level of national income?

Computational Procedures

National income elasticity of education of governmental functions is the degree to which governmental expenditures for education change with relation to changes

*The category of social welfare in this study does not strictly mean only the social welfare. It is used to represent such things as "other social services," "pension and/or retirement," or "social security, etc." as well as social welfare. This category is shown under several different names by various countries. For further information, see United Nations Statistical Yearbook, 1950-1969.

in national income. The formula for this analysis is given by the ratio of the former divided by the ratio of the latter. This formula is symbolically expressed as:

$$\frac{\frac{d E_g}{E_g}}{\frac{d Y}{Y}}$$ for an instantaneous change, and $$\frac{\frac{\Delta E_g}{E_g}}{\frac{\Delta Y}{Y}}$$ for a finite change (15), where d indicates an instantaneous change; Δ is for a finite change; E_g represents governmental expenditure; and Y is for national income. Elasticity is one way of measuring relative change. For the finite change, there are initial and final values of both variables, as well as values lying between these two.

Expenditures for governmental services are considered as some function of the national income. This functional relationship is suitable for computational purposes when reduced to logarithmic form and expressed in the regression formula as:

$$\underline{\text{Log } E_{ge} = \text{Log } a + b \text{ Log } Y}$$

This regression formula is used for the computation of national income elasticity values of educational and selected non-educational government expenditures among the thirty countries for the period from 1950 to 1967. The b value in the above formula is a type of finite elasticity coefficient. The applicability of this method has been probed by other researchers (14, 18, 19, 22, 24) in their income elasticity studies of education in the United States. The b value becomes the index of elasticity or responsiveness, which indicates the percentage change in per capita governmental expenditures associated with a 1.00 per cent change in per capita national income. National income elasticity values of various governmental expenditures are further analyzed on the basis of the national income levels: groups of high and low income.

The examination of relationships between national income of each country and its governmental expenditures for education and other functions for the period from 1950 to 1967 is attempted by using Pearson product-moment correlation coefficient. The Pearson product-moment correlation coefficient is also employed to examine the relationships between the yearly rate of change in public expenditures for education

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and the yearly rate of national economic growth among the thirty nations.

For the analysis of per capita educational government expenditure variations, which is represented as the effort ratios in this study, percentages of per capita governmental expenditures of GNP are calculated each year. Then, effort ratios are grouped into two categories according to the level of national income--the high and the low. In order to discover whether or not the financial effort devoted to education by the high income countries is greater than the low income countries, the t-ratio is computed. This ratio indicates the statistical significance of mean differences of the two groups.

To help facilitate most of the computations necessary for this study, the computer system, known as SOUPAC, a Digital Computer Laboratory in the University of Illinois Department of Computer Science, is used.

Selection of Variables

Variables used in this study for the computation of national income elasticities of educational and non-educational governmental expenditures and related other explorations are as follows:

1. As independent variable, per capita Gross National Product expressed in United States' current dollar values except for the case of India (national income) is used.
2. As dependent variables, per capita governmental expenditures expressed in United States' current dollars for education, total government, defense, health and social welfare are used.

They are selected as the reasonably acceptable measures and as most analogous to other studies and the availability of data. Other researchers (14, 18, 22, 24) have employed one or more of these variables in measuring income elasticities and established their suitability.

Assuming that governmental expenditures for public services are largely dependent upon the nation's financial ability, per capita Gross National Product has been chosen as the independent variable. Per capita Gross National Product seems to

be a good index of capacity for support of governmental functions, and this index is widely used by other researchers (6, 17, 29, 31) for their studies. In most studies which attempted to explain the variations of governmental expenditures, per capita income has been used as the most important single index of ability to support governmental activities.

Among various governments, the selected dependent variables can be meaningfully compared with the education variable. Since education comprises only one facet of all the other social services, comparison between expenditures for education with total governmental expenditures reveals the priority given to education within the total government, and comparison with other social services such as health and social welfare provides insight into the position of education within the same service function. Finally, comparison with defense reveals the relative place of two important governmental functions. The fact that United Nations authorities have been devoting efforts to present data for these variables in the Statistical Yearbooks (38) indicates the importance that these officials attach to these variables.

Selection of the Sample

The countries included in this study are listed earlier. Except for the Republic of China and the Republic of Korea, the selected time periods for all countries are from 1950 to 1967. For China, the period of time is from 1952 to 1967; and for the Republic of Korea from 1953 to 1967. The selections of the sample and the time period are decided after careful consideration of the geographical representation as well as the availability of data from consistent data sources. Consistent data could not be obtained prior to 1950.

Sources and Collection of Data

The statistical data used in this study are obtained largely from United Nations Statistical Yearbook (38), International Financial Statistics (21), United Nations Demographic Yearbook (36), United Nations Yearbook of National Accounts Statistics (39), United Nations Monthly Bulletin of Statistics (37). The United

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Nations and International Monetary Fund authorities use standardized questionnaire forms for collection of data from each country, so that data from these sources are relatively more adequate for comparative analysis than data gathered from different sources prepared by different independent organizations.

An attempt is made to secure data of one class from one source. For example, Gross National Product data are obtained from United Nations Yearbook of National Accounts Statistics; population data are from United Nations Demographic Yearbook; data on exchange rates of national currencies into United States' dollars are from International Financial Statistics; and data on government expenditures for education and other selected functions are derived from United Nations Statistical Yearbook. These sources are used because all data necessary for this investigation are not systematically and consistently available from a single source.

However, data regarding all governmental expenditures, by function and by year, necessary for this study are not provided completely for every country in the United Nations publications. When certain data are not consistently available by one source such as United Nations Statistical Yearbook, other sources (4, 5, 8, 20, 40*) are substituted.

Throughout this study, the term "national income" is used synonymously with Gross National Product. Dollar values refer to United States' dollars at current prices.

RESULTS

Specific questions investigated and the major findings in this study are as follows:

1. How have governmental expenditures for educational and non-educational functions among various nations responded over the years in relation to change in national income?

*Examples of substituted data sources regarding governmental expenditures are: Annual Abstract of Statistics for United Kingdom, Annuaire Statistique de la France, Anuario Estadistico for Honduras, Historical Abstract of Canada, New Zealand Official Yearbook, Statistical Abstract of Ceylon, Statistical Abstract of the United States, Statistical Data Book for the Republic of China, Statistisches Jahrbuch für die Bundesrepublik Deutshland, Statistical Outline for Indian Economy, and Statistical Yearbook for Japan.

By using regression line analysis, as reduced to logarithmic form, elasticity coefficients are computed. These elasticity coefficient values of various nations are summaries of governmental experiences in allocating financial resources to educational and selected non-educational functions in relation to changes in national income over the period of eighteen years. Elasticity coefficients reflect the average percentage change in per capita governmental expenditures which resulted from 1.00 per cent change in per capita Gross National Product over the same period.

Coefficient values of education range from 0.98 of South Africa to 3.88 of Honduras. The mean elasticity coefficient of all thirty countries is 2.05, which indicates that nations, on the average, are spending more for education with a 2.05 per cent increase when their national income changes with a 1.00 per cent increase. All countries except one have been allocating their financial resources to education at a faster rate than the rate of increase in the Gross National Product. The average elasticity coefficient value of education is greater than the average values of elasticity coefficients of other governmental functions.

To state this in detail, when per capita GNP inclusive of all thirty countries increases 1.00 per cent, on the average, increases in per capita governmental expenditures are: 2.05 per cent for education, 1.32 per cent for total government, 1.15 per cent for defense, 1.51 per cent for health, 1.41 per cent for social welfare, and 1.49 per cent for health plus social welfare. These coefficients indicate that governmental expenditures for various functions in this study are all increasing at a faster rate than the rate of growth in the national economy.

2. <u>Are these different levels of responsiveness in expenditures on governmental functions over the years associated with the level of national income</u>?

The low income countries in this study reveal, on the average, higher elasticity coefficient values for most selected governmental functions, except health, than the high income countries. Higher values of income elasticity coefficients of the low income countries indicate that the low income countries are, in general, endeavoring

harder than the high income countries to increase per capita governmental expenditures for education and for non-educational activities, except health, in relation to 1.00 per cent of increase in their national income over the eighteen-year period from 1950 to 1967.

Mean elasticity coefficients of the low income countries are 2.26 for education, 1.49 for total government, 1.51 for defense, 1.14 for health, 1.78 for social welfare, and 1.84 for health and social welfare. In the high income countries these coefficients are 1.78 for education, 1.14 for total government, 0.79 for defense, 1.75 for health, 1.17 for social welfare, and 1.26 for health and social welfare.

An inference that may be developed from these elasticity values is that the relative importance of education among various governmental functions has been increasingly recognized with more emphasis than other governmental sectors. Twenty-seven countries in this study substantiate this notion with data for the period from 1950 to 1967.

3. Are the governmental expenditures on education and selected non-educational functions of each nation correlated with its national income?

By using Pearson Product-moment correlation formula, the correlation coefficients of the regression lines determining responsiveness of educational and non-educational government expenditures for each country are computed.

Correlation coefficients between per capita educational and selected non-educational government expenditures and per capita national income of each country over the eighteen-year period are generally very high except the function of defense, which shows an average of 0.77. Mean values of correlation coefficients of all countries are 0.95 for education, 0.95 for total government, 0.77 for defense, 0.89 for health, 0.89 for social welfare and 0.88 for health and social welfare. Expenditures for the education and total government categories respond most consistently and expenditures for defense show the least consistency among all in relation to national income. High correlation coefficients for coordinates of per capita educational and other non-educational expenditures, except defense expenditures, and

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per capita national income for each country support the fact that these corres
ponding increases in expenditures for education, total government, health and
welfare have occurred rather consistently for the period from 1950 to 1967.

In both the high and the low income groups, correlation coefficients betw
education and national income are the highest among all other values within th
group, respectively. Next to this is the correlational value between the tota
government and national income.

Correlational values disclose that the high income countries have higher
lation coefficients for all comparative pairs with the selected functions than
low income countries. These correlations indicate that the variance of expend
per head in the high income countries are most closely associated with their v
of national income than the case of the low income countries. In other words,
ability to support governmental services may explain a great deal of the diver
practices in governmental expenditures among countries.

In the previous section, relationships between national income and goverr
expenditures for education and selected non-educational functions based on pra
of each country for the entire time period have been discussed. In order to c
correlation coefficients between governmental expenditures for education and n
income within each nation with those correlation coefficients among countries
cross-sectional basis, Pearson product-moment correlation coefficients between
two variables for each year are computed. Values of eighteen correlation coef
are very close to one another. They range from 0.80 to 0.90. The mean of the
eighteen correlation coefficients is 0.87. This also indicates that various g
ments are consistently allocating their governmental spendings for education y
after year in relation to national income. Variations from one year to anothe
very small. Cross-sectional correlation coefficients are very high and surpri
consistent from one year to another for the entire period from 1950 to 1967.
these cross-sectional correlation values with a mean of 0.87 are slightly lowe
correlation coefficients of each nation's overall practice on educational expe

for the eighteen-year period. Except for three countries, correlation values within each country are above 0.90 with the mean value of 0.95.

4. Is the rate of change in expenditures for education related to the rate of change in national economic growth as measured in an aggregate United States' dollar amount?

Another question investigated in this study is to explore the relationships between the rate of change in governmental expenditures for education and the rate of change in national income on the year-to-year basis among countries. The rate of change in governmental expenditures for education of each country for each year is obtained as the ratio of the amount of change over the preceding year divided by the amount of expenditure in the preceding year. The rate of change in national income is secured through the same computational procedure. This method provides the sample size of twenty-seven for each correlational computation, since the data in three countries are incomplete. Two rates of increase are computed for each country, one for educational expenditure and the other for national income.

Correlation coefficients for each two-year period from 1950-51 to 1966-67 were computed. These correlations are not as high as correlations previously presented and discussed. Yet, they represent positive and fairly high correlation values throughout the entire time period, except two periods, 1958-59 and 1959-60. The mean correlation coefficient of fifteen two-year periods, by excluding two negative values, is 0.46. The mean of all correlation coefficients shows 0.40. In two-year periods, 1958-59 and 1959-60, correlation coefficients are -0.05 and -0.13 respectively. Nevertheless, from data found here it would be reasonable to conclude that if a nation's Gross National Product increases at a certain rate each year, its expenditures for education, in general, may also increase at the similar rate. Fairly low correlation coefficients between these two variables are presumably due to the fact that changes in national income on the year-to-year basis reflect annual disturbances to the expenditures for education.

5. How much variation is there in the level of public expenditures for education, as measured in terms of United States' dollar values and percentages of national income, in relation to national income level among countries?

The ability of a nation to support governmental services is defined as per capita Gross National Product expressed in United States' dollar amounts at current market prices. This variable is considered one of the best measures available in this respect (15). Effort ratio is defined as the proportion of the national income spent by a nation's government for its public services. It is expressed as percentages of national income allocated to governmental services in the nation.

Average percentages of governmental expenditures for education out of national income of all countries, of the high income and the low income countries, and the differences of percentages between the high income group and the low income group are computed. The average effort ratio for education of all countries, expressed in percentage value here is 1.45 for the year 1950. This ratio gradually increases with the passage of time and reaches 3.09 in 1967. This change indicates that each nation is increasing its financial effort for education concurrently with national economic growth.

The high income countries are devoting more effort, in terms of percentages of financial resources out of GNP, to education than the low income countries. The high income countries, on the average, spent 1.70 per cent of their national income for education in 1950, whereas the low income group expended 1.16 per cent in the same year. In 1967, the average effort ratio of high income countries was 3.69, while it was 2.49 for the low income nations. Average effort ratios of high income countries have been increasing faster than the low income group, so that differences between the two groups have also been growing gradually over the years from 0.54 per cent in 1950 to 1.20 per cent in 1967.

As discussed earlier, the relationships between per capita Gross National Product, a measure of ability to support, and per capita governmental expenditure

level were highly correlated, both within the country and cross-sectionally among various countries.

Correlation coefficients between per capita Gross National Product and governmental effort ratios (percent of national income) for education among the thirty countries, each year for the eighteen-year period, are all positive. This is an indication of the existence of some functional relationship between two variables. In general, it can be stated that the countries more able to support education may devote more effort to education. However, correlation coefficient values are not high enough so that the above statement can be assured to be widely true. Correlation coefficients range from 0.28 in 1951 to 0.48 in 1950, and the mean value of eighteen correlation coefficients is 0.36.

In order to investigate the existence of differences between effort ratios of the high income countries and the low income countries for each year for the period of eighteen years, t-ratios are computed to compare means of effort ratios of two groups each year for the eighteen-year period. Except for three years, 1959, 1960, and 1962, all of the t-ratios are statistically significant for a one-tailed test at the .05 level. This means that, except for three years, chances of effort ratios of the high income countries becoming greater than the low income countries are 95 times out of 100.

In conjunction with correlation coefficient values between the level of financial ability and the effort ratio, these t-ratios again indicate that, in general, the high income countries tend to devote a larger effort to education than the low income countries. But in view of the fact that for three separate years, 1959, 1960, and 1962, t-ratios are not statistically significant for a one-tailed test at the .05 level, the above argument is not wholly true. Occasionally low income countries are putting more, or as much, effort to education than high income countries.

Effort ratios in this study may be affected by many factors—demographic, political, social, and cultural, as well as economic. The combined effects of these variables of a country are reflected in a single effort ratio for each year. Analysis

of these variables affecting effort ratios may be conducted by using a multiple correlational analysis technique. However, analysis of these variables is beyond the scope of this study.

CONCLUSIONS AND NECESSARY FUTURE RESEARCH

Conclusions

Findings in this study lead to several conclusions. The importance of educational services among governmental activities in many countries has been receiving favorable recognition in relation to national income. Extrapolation of these trends indicates that as societies advance, education will gain a high priority in the government of most countries. The fact that coefficients of national income elasticities of education are higher than other categories of governmental expenditures in the majority of countries in this study substantiates this conclusion.

High income countries will tend to allocate more governmental financial resources to education to achieve a better and higher level of education, and, in turn, progressively enhance the level of the national economy. The low income countries will tend to spend relatively less money for education to get relatively poorer education, and, accordingly, progress slowly in economic development.

These trends may bring serious gaps between the levels of educational development as well as economic progress in the high income and the low income countries. The logic of these trends implies that in order to help facilitate the economic progress in the low income countries and build an international welfare society, a large-scale foreign aid program for education with financial as well as technical assistance will be required in the low income countries.

During the eighteen-year period of this study, the income elasticity of education in the low income countries was higher than in the high income countries. This difference has two important implications. One is that the low income countries are attaching relatively more importance to education among governmental services than the high income countries in relation to the increase in national income. The other is that educational government expenditures of the high income countries are

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still far from their relative capacity, and they should be able to expend even a larger proportion of national income to education than they have been doing in the past.

In some low income countries, the relatively low percentages of governmental expenditures out of the national income devoted to education suggest that education can reasonably demand a larger proportion of national income as compared with other low income nations' practice. But these low income countries seem to reach the limits of their financial capacities for education sooner or later.

Accordingly, the findings in this study indicate trends that have value in projecting future demand of governmental financial resources for education in relation to change in national income. They furnish a crucial and strategical measure for analysis of problems in allocating future governmental financial resources to education in many countries.

Necessary Future Research

It is necessary to carry out further studies in this area with more standardized data for a longer period of time by including a larger number of countries. The analysis based on the macro-level should be further elaborated so as to provide for more sophisticated micro-analysis. An aggregate form of expenditures on education must be subdivided into various components of levels of education; elementary, secondary, and higher levels; and general and vocational-technical education. This type of micro-analysis must be carefully studied in consideration of economic, political, demographic, social and cultural characteristics of each country.

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